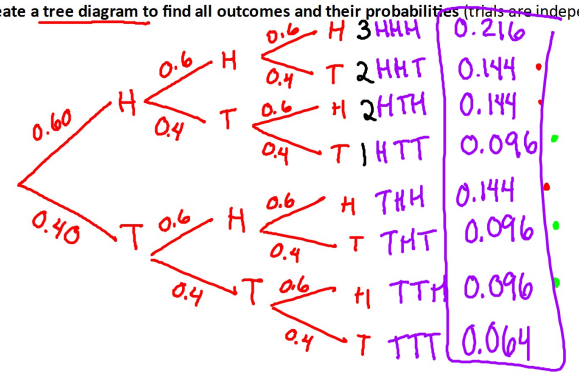
Ch. 8 notes (8.2) Creating probability models

Example: Unfair Coin P(H) = 0.6 Toss 3 times Let X = # of Heads

The key to these situations: all trials are independent

Create a tree diagram to find all outcomes and their probabilities (trials are independent):



Using the outcomes and their probabilities, create a probability distribution below for the number o heads in 3 tosses of the coin:

Heads	0	1	2	3
P(Heads)	0.064	0.288	0.432	0.216

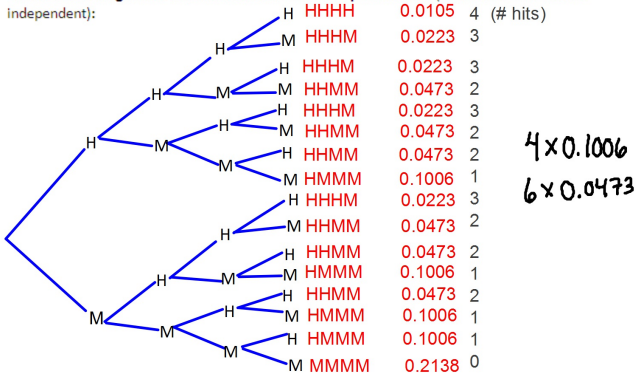
1. What is the expected number of heads in three tosses?
   $E(H) = 1.8$
2. What is the probability that I will get all 3 heads?
   $P(H=3) = 0.216$
3. What is the probability that I get 0 heads?
   $P(H=0) = 0.064$
4. What is the probability that I get less than 2 heads?
   $P(H<2) = 0.352$

$P(0<H<3) = 0.72$

Example: Major League Hitter P(H) = 0.32

A certain batter has a 0.32 chance of getting a hit at any at bat. Assume that the batter goes to bat 4 times in a game and either gets a hit or gets out each time. Each at bat is independent of the others

Create a tree diagram to find all outcomes and their probabilities (remember all trials are independent):



4×0.1006

6×0.0473

Using the outcomes and their probabilities, create a probability distribution below for the number of hits in 4 at bats:

Hits	0	1	2	3	4
P(Hits)	0.2138	0.4025	0.2841	0.0891	0.0105

- What is the expected number of hits in each game? E(H) = 1.28 hits
- Answer the following questions:

P(X=3) 0.0891

P(X=1 or X=2) 0.6866

P(X<1) 0.2138

P(X>1) 0.3837

Probability that he gets 2 hits in a game 0.2841 = P(X=3)

Try these:

1. Suppose the probability that a light bulb is defective is .1.

a. Using a tree diagram, create a probability model for the # of defective light bulbs out of 4.

b. What is the probability that at least two of the light bulbs are defective?

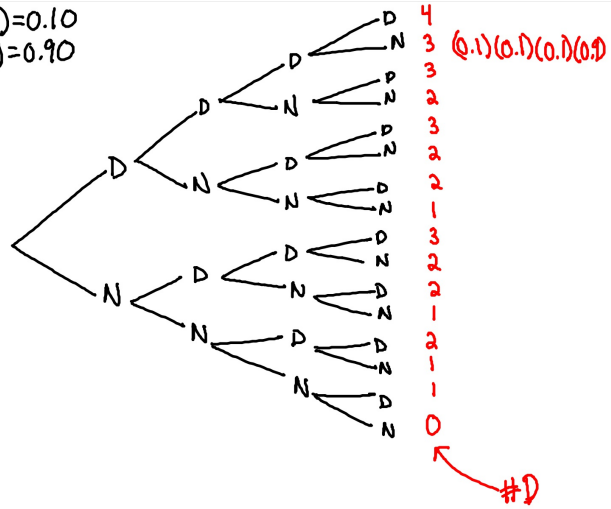
c. What is the probability that more than two light bulbs are defective?

d. What is the probability that 1 or less light bulbs are defective?

e. What is the EXPECTED number of defective light bulbs?

$P(D) = 0.10$

$P(N) = 0.90$



X		P(X)
0	0.6561 x 1	0.6561
1	0.0729 x 4	0.2916
2	0.0081 x 6	0.0486
3	0.0009 x 4	0.0036
4	0.0001 x 1	0.0001

(b) $P(X \geq 2) = 0.0523$

(c) $P(X > 2) = 0.0037$

(d) $P(X \leq 1) = 0.9477$

(e) $E(X) = 0.4$ light bulbs

Try the next 2 examples

2)

X	0	1	2	3
P(X)	0.343	0.441	0.189	0.027

(b) $P(X = 2) = 0.189$

(c) $P(X > 2) = 0.027$

(d) $P(X < 3) = 0.973$

(e) $P(X = 1) = 0.441$

3) (a)

X	0	1	2	3
P(X)	0.2076	0.40	0.2888	0.0112

(b) $P(X = 1) = 0.40$

(c) $P(X = 2) = 0.2888$

(d) $P(X > 3) = 0.0112$

(e) P(X=2 or X=4) = 0.30

(f) $P(X < 3) = 0.8964$